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Hemiurid Trematodes of *Kyphosus* Collected around Cape Shionomisaki, Kii Peninsula

By

Masaaki MACHIDA*

町田昌昭*: 紀伊半島潮岬周辺で得られたテンジクイサギの Hemiuridae 吸虫

A survey was made on the parasites of marine fishes around Cape Shionomisaki, Kii Peninsula, in October, 1979 under the Natural History Research Project of the Japanese Archipelago by the National Science Museum, Tokyo. Cape Shionomisaki is situated on the southern tip of Honshu, the main island of Japan, and washed by the warm Kuroshio current throughout the year.

Although many fish parasites were collected in this survey, the present report deals with four species of hemiurid trematodes from *Kyphosus*, in them one new genus and three new species are included. As indicated by MANTER (1965), *Kyphosus* is a very favorable host for trematodes, and these trematodes are mostly of distinctive, specialized types.

The trematodes obtained were fixed in acetic sublimate or 70% ethanol under slight pressure, stained with Heidenhain's hematoxylin or alum carmin and mounted in balsam. The specimens are deposited in the collection of the National Science Museum, Tokyo.

I wish to express my cordial thanks to Mr. T. SUGA and other members of the Kushimoto Fishermen's Co-operative Association, Wakayama Prefecture, for providing me facilities to collect the fish parasites. Thanks are also due to Dr. S. KAMEGAI, Meguro Parasitological Museum, Tokyo, who allowed me to examine the paratypes of *Genolinea kyphosi* and *Opisthadena kyphosi* in YAMAGUTI Collection.

Subfamily Derogeninae

Genolinea isuzumi n. sp. (Figs. 1–2)

Habitat. Stomach of *Kyphosus cinerascens*; Kii Peninsula, Japan.

Specimen No. NSMT-Pl 2292 a (holotype) and 2288 a.

Description. Body subcylindrical, tapering posteriorly, 2.08–2.69 mm long, 0.52–0.58 mm wide at level of acetabulum. Oral sucker subterminal, globular, 0.13–0.21×0.16–0.26 mm. Pharynx globular, 61–82×82–110 μ; esophagus very short; caeca comparatively wide, terminating a short distance anterior to posterior extremity. Acetabulum large, more or

* Department of Zoology, National Science Museum, Tokyo
国立科学博物館 動物研究部

less protrudent, 0.30–0.42×0.33–0.46 mm, situated in anterior part of middle third of body. Sucker ratio 1:1.5–2.2.

Testes oval, anterior testis 0.10–0.51×0.18–0.25 mm and posterior testis 0.11–0.19×0.18–0.26 mm, a little obliquely tandem in middle part of hindbody, separated by uterine coils. Seminal vesicle tubular, winding, 26–49 μ wide, preacetabular, connected anteriorly with pars prostatica by narrow curved duct. Pars prostatica cylindrical, with thick wall, 60–100 μ long and 18–21 μ in inside diameter, lined with villous epithelia which connect with the duct from prostatic cells, and surrounded by large prostatic cells. Hermaphroditic pouch globular, 77–116×93–114 μ, provided with circular and longitudinal muscles, enclosing slender hermaphroditic duct. Hermaphroditic duct consisting of two portions; proximal portion lined with thin collageous membrane; distal portion eversible, provided with thin musculature. Genital pore some distance posterior to caecal bifurcation.

Ovary subglobular, 92–138×173–250 μ, situated at midlevel of caudal third of body. Seminal receptacle absent. Vitellaria immediately postovarian, divided into two compact lobes, obliquely tandem; anterior lobe 82–138×128–248 μ, posterior lobe 82–140×145–204 μ. Receptaculum seminis uterium present. Uterus first descending to posterior extremity, then ascending dorsal to gonads and acetabulum; metraterm short. Eggs elliptical, 24–29×12–16 μ. Excretory arms uniting dorsal to pharynx; pore midventral at some distance from posterior extremity.

Discussion. This species differs from all others in *Genolinea* by having receptaculum seminis uterium instead of a seminal receptacle, the hermaphroditic duct consisting of two portions, and the excretory pore lying midventral at some distance from the posterior extremity.

The specific name refers to the Japanese genus name of the host.

Genolinea chilostoma n. sp. (Figs. 3–4)

Habitat. Stomach of *Kyphosus cinerascens*; Kii Peninsula, Japan.

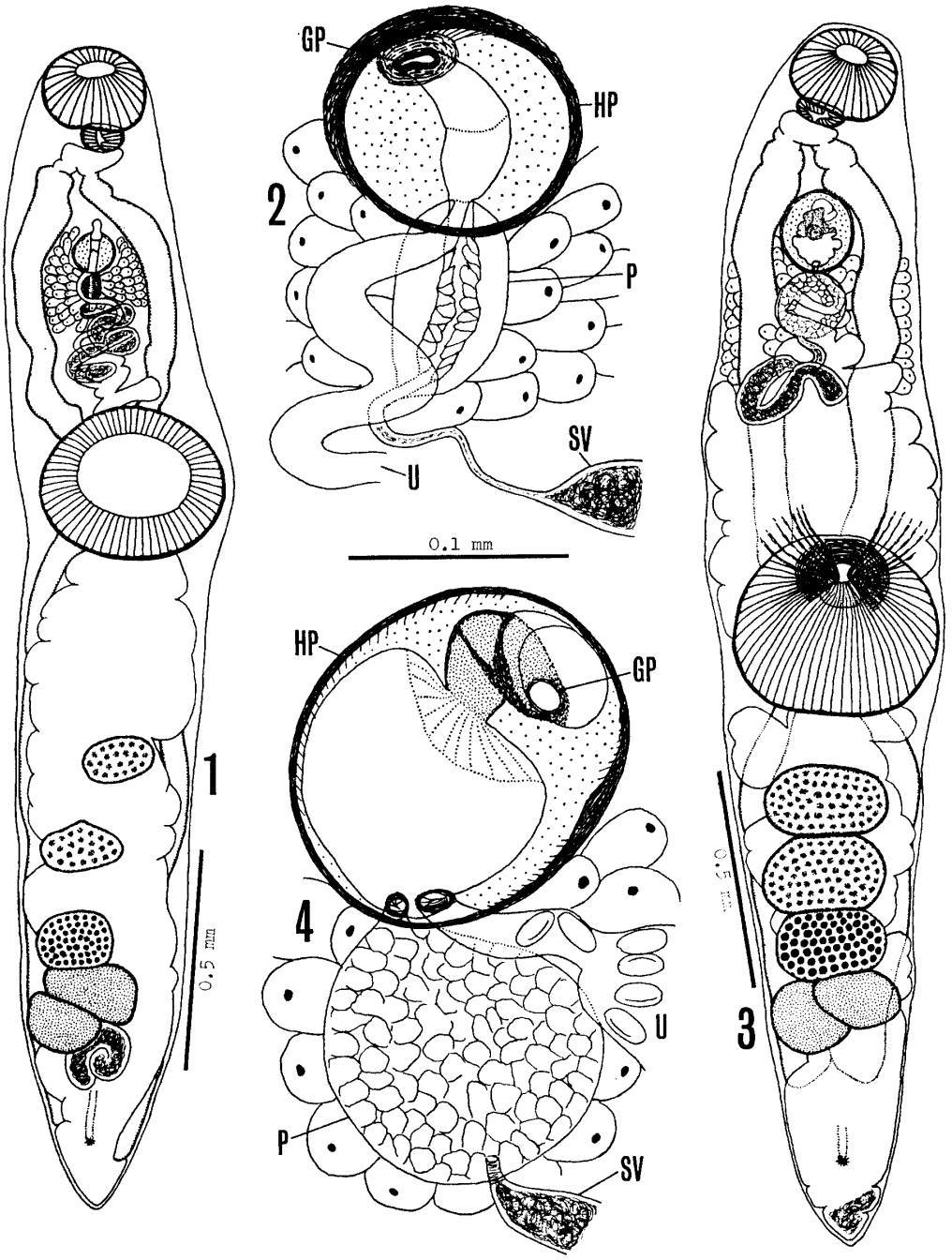
Specimen No. NSMT-Pl 2292 b (holotype), 2234 a and 2288 b.

Description. Body subcylindrical, tapering posteriorly, 1.46–2.65 mm long, 0.32–0.55 mm wide at acetabular level. Oral sucker subterminal, 0.13–0.22×0.15–0.25 mm, directly followed by globular pharynx, 56–77×61–112 μ; esophagus short; caeca comparatively wide, terminating blindly at short distance posterior to vitellaria. Acetabulum large, 0.24–0.41×0.27–0.46 mm, situated just postequatorial, with two sphincter-like lateral lips, posteriorly interrupted. Sucker ratio 1:1.6–2.0.

Testes ovate, extended transversely, anterior testis 67–163×154–286 μ, posterior testis 70–173×155–281 μ, directly tandem in anterior part of caudal third of body. Seminal vesicle tubular, sigmoid, 49–82 μ wide, near middle of forebody, with its anterior end opening into pars prostatica. Pars prostatica rounded, 108–168 μ in diameter, lined with tuft epithelia and surrounded by large prostatic cells. Hermaphroditic pouch subglobular, 121–193×101–168 μ, provided with longitudinal and circular muscles. Hermaphroditic duct is constricted near its middle into two portions. Proximal portion vesicular, lined with collageous membrane; distal portion folded but may be eversible, provided with microvilli.

Genital pore some distance posterior to caecal bifurcation.

Ovary oval, 54–193×162–286 μ, just behind posterior testis, at midlevel of hindbody. Vitellaria consisting of two compact oval lobes, directly tandem or somewhat obliquely immediately posterior to ovary; anterior lobe 72–168×137–255 μ, posterior lobe 75–143×108–



Figs. 1–2. *Genolinea isuzumi* n. sp. ——1. Entire worm, ventral view. ——2. Terminal genitalia, ventral view.

Figs. 3–4. *Genolinea chilostoma* n. sp. ——3. Entire worm, ventral view. ——4. Terminal genitalia, ventral view. GP, genital pore; HP, hermaphroditic pouch; P, pars prostatica; SV, seminal vesicle; U, uterus.

214 μ. Seminal receptacle absent. Receptaculum seminis uterium present. Uterus descending to posterior extremity and then ascending, occupying all space till posterior end of hermaphroditic pouch. Metraterm short, entering into hermaphroditic pouch together with pars prostatica. Eggs elliptical, 25–28 $\times$ 12–15 μ. Excretory arms united dorsal to pharynx. As in above *G. isuzumi*, excretory pore lying midventral at some distance anterior to posterior extremity.

Discussion. This species is like *G. isuzumi* in lacking seminal receptacle, the hermaphroditic duct consisting of two portions, and the excretory pore lying a little away from the posterior extremity, but differs from it in the acetabulum being just postequatorial and provided with two sphincter-like lateral lips, the testes and ovary located contiguously tandem, the round pars prostatica, etc.

YAMAGUTI (1970) described *G. kyphosi* from *Kyphosus cinerascens* in Hawaiian waters. It is 0.88 to 1.35 mm long and has eggs 21 to 30 by 11 to 14 μ. My own examination of paratypes of *G. kyphosi* (MPM Coll. No. 15184) revealed that the seminal receptacle is lacking and the excretory pore lies on the ventral side at some distance anterior to the posterior extremity. In these respects, *G. kyphosi* is alike *G. chilostoma*, but differs from it in having smaller body size and the structure of the terminal genitalia.

In addition, the paratypes of *G. kyphosi* are mixed with another related species, of which YAMAGUTI (1970) made no mention. It is almost the same size as *G. kyphosi*, but has no acetabular sphincter and an excretory pore a little away from the posterior extremity, so that it seems to resemble *G. isuzumi* except for body size.

Subfamily Opisthadeninae

Opisthadena dimidia LINTON, 1910 (Figs. 5–6)

Habitat. Stomach of *Kyphosus cinerascens*; Kii Peninsula, Japan.

Specimen No. NSMT-Pl 2234 b and 2289.

Description. Body elongate, cylindrical, 4.7–13.2 mm long, 0.76–1.88 mm wide at acetabular level. Oral sucker subterminal, subglobular, 0.16–0.38 $\times$ 0.21–0.42 mm, embedded in anterior end of body. Preoral lip present. Mouth provided with seven pairs of papillae. Pharynx globular, 0.13–0.25 $\times$ 0.11–0.27 mm; esophagus short; caeca terminating close to posterior extremity. Acetabulum large, 0.59–1.38 $\times$ 0.57–1.43 mm, situated at middle of anterior third of body, with a postacetabular transverse fold of body wall. Sucker ratio 1:2.8–3.5.

Testes oval, tandem, postequatorial; anterior testis 0.26–0.44 $\times$ 0.37–0.53 mm, posterior testis 0.27–0.45 $\times$ 0.37–0.59 mm. Seminal vesicle elliptical, 0.24–0.69 $\times$ 0.15–0.47 mm, at equatorial. Pars prostatica extending from seminal vesicle to some distance posterior to acetabulum, 0.19–0.35 mm wide including dense coat of prostatic cells. Hermaphroditic pouch pyriform, 0.17–0.46 $\times$ 0.13–0.22 mm, consisting of longitudinal and circular muscles, continued anteriorly into muscular wall of genital atrium. Hermaphroditic duct wider at its base, lined with villi and surrounded by gland cells except for anterior end. Genital cone truncated. Outside the pouch at its posterior edge occurring a cluster of gland cells.

Ovary ovate, somewhat extended transversely, 0.27–0.43 $\times$ 0.33–0.71 mm, about midlevel

of caudal third of body. Seminal receptacle oval, anterodorsal to ovary, 0.21–0.52×0.23–0.72 mm. Vitellaria immediately postovarian, divided into two compact lobes, juxtaposed; right lobe 0.23–0.47×0.28–0.45 mm, left lobe 0.22–0.47×0.24–0.55 mm. Shell gland compact subglobular, 0.14–0.25 mm in diameter, dorsal between ovary and vitellaria. Short oviduct arising from posterior part of ovary, connected with duct from seminal receptacle and vitelline reservoir before entering ootype. Uterus descending a short distance posterior to vitellaria, then ascending in transverse coils to posterior end of acetabulum, whence narrow metraterm runs straight forward parallel to male duct. Eggs elliptical, 27–37×13–16 μ. Excretory vesicle tubular, bifurcating posterior to acetabulum; arms with bulbous branches in forebody, uniting dorsal to oral sucker.

Discussion. My specimens closely resemble *Opisthadena dimidia* LINTON, 1910 and *O. kyphosi* YAMAGUTI, 1970 except that some of my specimens have larger body size. *O. kyphosi* was taken from *Kyphosus cinerascens* by YAMAGUTI (1970) in Hawaiian waters. According to him, *O. kyphosi* differs from the closely related *O. dimidia* of MANTER (1947), which was found in the same genus of host, by having no oral papillae, acetabulum lying in front of the middle of anterior third of body, and an elliptical, curved seminal vesicle as compared with five pairs of oral papillae, acetabulum lying behind the middle of anterior third of body, and a round seminal vesicle. My own examination of paratypes of *O. kyphosi* (MPM Coll. No. 15245) revealed that the lack of oral papillae is caused by contraction of the worm. In fact, my Japanese specimens contain individuals with from three to seven pairs of oral papillae owing to a condition in flattening pressure during fixation. My specimens have an acetabulum in front of the middle of anterior third of body as in *O. kyphosi*, but LINTON (1910) illustrated an acetabulum at midlevel of anterior third of body in *O. dimidia*. Furthermore, YAMAGUTI (1970) incorrectly stated that the seminal vesicle was round in *O. dimidia*, but exactly it was illustrated as elliptical by LINTON (1910) and described as ovoid by MANTER (1947). My specimens show that it is round during the preadult, whereas elliptical in the adult, but not always curved as in YAMAGUTI's description. Because of these variations and intergradations, I consider *O. kyphosi* as a synonym of *O. dimidia*.

OVERSTREET (1969) discussed *Opisthadena cortesi* BRAVO-HOLLIS, 1966, taken from *Kyphosus elegans* in the Gulf of California, Mexico, to be synonymous with *O. dimidia*.

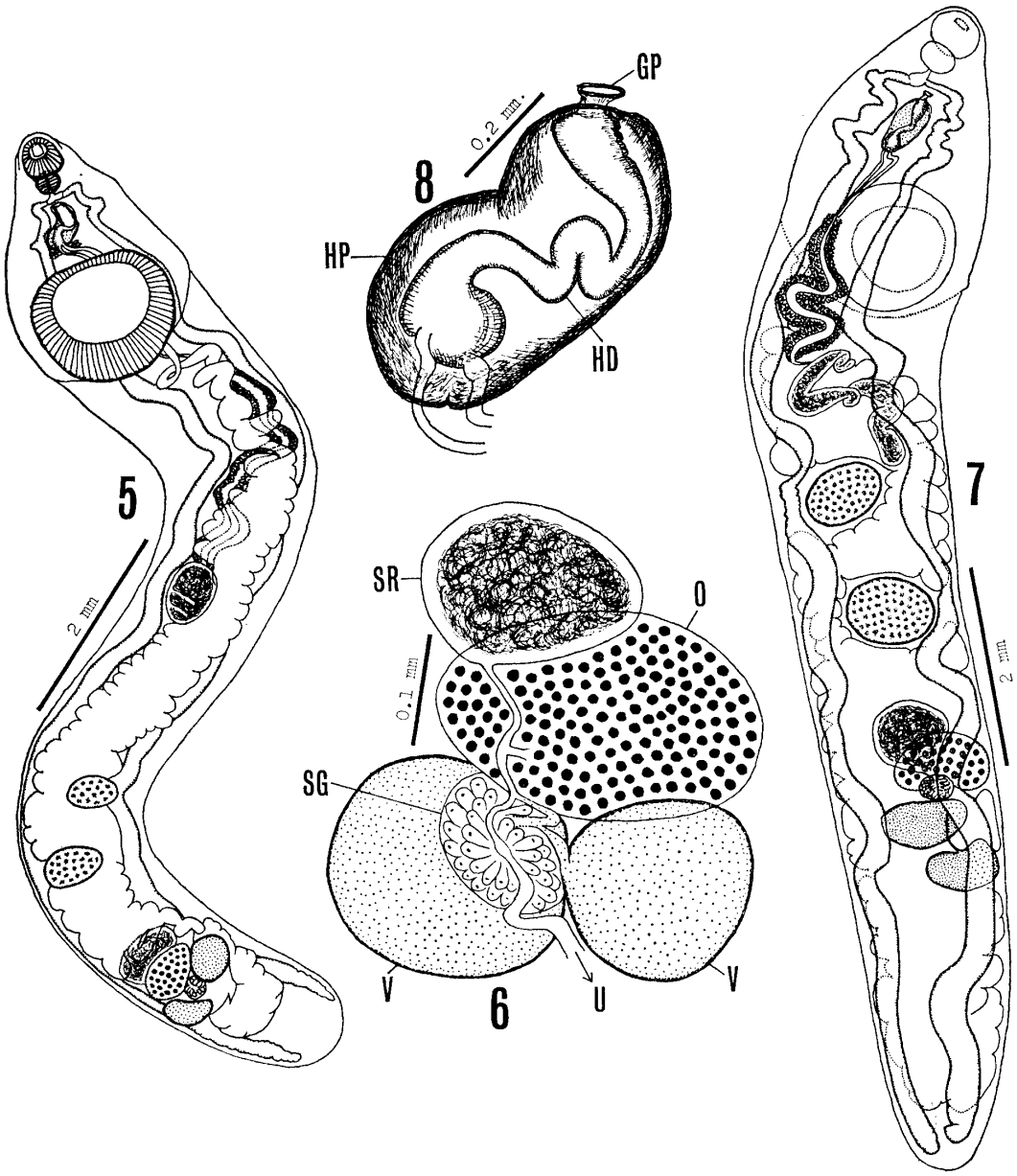
Consequently, *Opisthadena dimidia* has been recorded from *Kyphosus* spp. from Florida (LINTON, 1910; MANTER, 1947; OVERSTREET, 1969), Panama Pacific and British Indies (SOGANDARES-BERNAL, 1959), Gulf of California (BRAVO-HOLLIS, 1966), South Australia (MANTER, 1966), Hawaii (YAMAGUTI, 1970) and Japan. In Japan, it occurs at the Ogasawara Islands (NSMT-Pl 1996 b. MACHIDA and YAMAGUCHI, unpublished data) and Cape Shionomisaki.

Neopisthadena habei n. g., n. sp. (Figs. 7–8)

Habitat. Stomach of *Kyphosus cinerascens*; Kii Peninsula, Japan.

Specimen No. NSMT-Pl 2293.

Description. Body large, cylindrical, 9.9–14.2 mm long, 1.95–2.50 mm wide at postacetabular level. Oral sucker subterminal, spherical, 0.39–0.49×0.53–0.65 mm, embedded in anterior end of body. Mouth provided with eight pairs of papillae, of them ventral pair is



Figs. 5–6. *Opisthadena dimidia* LINTON, 1910. ——5. Entire worm, ventral view. ——6. Ovarian complex, dorsal view.

Figs. 7–8. *Neopisthadena habei* n. g., n. sp. ——7. Entire worm, dorsal view. ——8. Hermaphroditic pouch, ventral view. GP, genital pore; HD, hermaphroditic duct; HP, hermaphroditic pouch; O, ovary; SG, shell gland; SR, seminal receptacle; U, uterus; V, vitellarium.

largest. Pharynx globular, 0.26–0.31×0.35–0.43 mm; esophagus short; caeca comparatively wide, terminating close to posterior extremity. Acetabulum large, 1.20–1.60×1.25–1.50 mm, situated in posterior half of anterior third of body. Sucker ratio 1:2.1–2.5. Semicircular transverse fold running across ventral side of postacetabular region.

Testes oval, tandem, in middle third of body; anterior testis 0.54–0.64×0.82–1.08 mm, posterior testis 0.63–0.80×0.88–1.11 mm. Seminal vesicle tubular, winding, 0.16–0.21 mm

wide, extending in median field from anterior testis to acetabulum. Pars prostatica connected with seminal vesicle by narrow duct, a little winding, 0.30–0.49 mm wide including dense coat of prostatic cells, reaching near anterior end of acetabulum. Ejaculatory duct long, running straight parallel to distal portion of uterus and metraterm, then entering into hermaphroditic pouch. Hermaphroditic pouch pyriform, 0.54–0.86 × 0.20–0.38 mm, provided with longitudinal and circular muscles. Hermaphroditic duct lined with transversely wrinkled cuticle; vesicular proximally and funnel-shaped distally. Genital atrium shallow. No genital cone. Genital pore just posterior to caecal bifurcation.

Ovary ovoid, 0.40–0.59 × 0.98–1.21 mm, at junction between middle and caudal third of body. Seminal receptacle immediately anterodorsal to ovary, 0.72–1.15 mm in transverse diameter. Vitellaria just postovarian, consisting of two compact lobes, tandem or somewhat obliquely; anterior lobe 0.37–0.59 × 0.84–1.18 mm, posterior lobe 0.36–0.55 × 0.77–1.07 mm. Shell gland compact oval-shaped, dorsal between ovary and anterior vitellarium, 0.18–0.33 × 0.42–0.57 mm. Short oviduct arising from posterior end of ovary, connected with duct from seminal receptacle and then with vitelline reservoir before entering ootype. Uterus descending to near posterior extremity and ascending filling space midlevel between acetabulum and anterior testis, whence it runs along pars prostatica. Metraterm narrow and straight. Eggs elliptical, 31–37 × 15–19 μ. Excretory vesicle tubular, bifurcating posterior to acetabulum; arms uniting dorsal to oral sucker; pore terminal.

Discussion. This genus differs from the closely related *Opisthadena* in the seminal vesicle being tubular, the gonads as a whole lying more anteriorly, the excretory arms without bulbous branches in the forebody, and having no genital cone.

The specific name is in honor of the malacologist Dr. T. HABE, who retired from the Director of the Department of Zoology, National Science Museum, Tokyo, in April, 1980.

Addendum. Two individuals of this species (NSMT-Pl 1996 a) were also obtained from the stomach of the same host, *Kyphosus cinerascens,* at the Ogasawara Islands in July, 1976 (MACHIDA and YAMAGUCHI, unpublished data). Though smaller in body size (6.25 × 1.35 and 7.50 × 1.55 mm), they are of the same structure as described above.

Neopisthadena n. g.

Hemiuridae, Opisthadeninae. Body large, cylindrical, without tail. Oral sucker small, subterminal, embedded in anterior end of body; pharynx well developed; esophagus short; caeca terminating close to posterior extremity. Acetabulum large, in anterior third of body. semicircular transverse fold running across ventral side of postacetabular region. Testes tandem, in middle third of body. Seminal vesicle winding tubular, extending from anterior testis to acetabulum; pars prostatica somewhat winding, reaching near anterior end of acetabulum; ejaculatory duct long. Hermaphroditic pouch preacetabular; hermaphroditic duct lined with transversely wrinkled cuticle. Genital pore just posterior to caecal bifurcation. Ovary ovoid, with two compact lobes of vitellaria immediately posterior, at junction between middle and caudal third of body. Seminal receptacle present. Uterus reaching near posterior extremity. Excretory vesicle Y-shaped; arms united anteriorly, without branches. Parasitic in stomach of marine teleosts.

Type-species: *Neopisthadena habei* n. sp.

要　　約

Kyphosus（イスズミ）属の魚は沿岸の岩礁に生息して海藻や小動物を食餌とし，地中海を除く暖海にひろく分布している．MANTER (1965) によれば，*Kyphosus* は吸虫にとって非常に好適な宿主で，当時21種の二生吸虫が記録されていたが，その後今回の報告を含めて15種の二生吸虫が新種として追加されている．これらの吸虫の多くは *Kyphosus* 特有のものである．

MANTER はカリブ海，オーストラリア，アメリカ太平洋沿岸，ハワイ，紅海などにおける *Kyphosus* の吸虫相の知見から①宿主も寄生虫もインド・太平洋起源であり，②それらが南オーストラリアに分散して，そこで隔離されたものもあり，③さらに太平洋を経由してカリブ海やアフリカ東部へ分散した．④日本やハワイは吸虫相が貧弱なので，*Kyphosus* の分布上わき道にあたるのではないかと述べている．当時 *Kyphosus* の二生吸虫は，ハワイで *Deontacylix* sp. と *Enenterum aureum* の2種の報告があるのみで，日本では全く記録がなかった．しかしその後ハワイでは YAMAGUTI (1970) により二生吸虫7種（*Deontacylix kyphosi, Enenterum elongatus, E. kyphosi, Jeancadenatia pacifica, Koseiria kyphosi, Genolinea kyphosi, Opisthadena kyphosi*）が新種として追加され，また日本でも市原 (1969) により *Enenterum* 属の新種と思われる2種と今回の報告の4種が記録された．今後さらに調査が進めば種数も増加すると思われる．このようにハワイや日本の *Kyphosus* の吸虫相は決して貧弱なものではなく，調査不十分に由来するものであった．

二生吸虫は中間宿主を必要する複雑な生活史をもっているので，宿主が新たな環境に適応できても吸虫も同じように適応できるとは限らない．また新たな環境で新たに分化した吸虫をもつ可能性もあろう．*Kyphosus* の吸虫の最近の知見を考慮すれば，日本やハワイのような分布の北限にあたる海域でも吸虫相は豊かであり，それぞれの海域に特徴的なファウナを形成していると考えられる．

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Addendum. Recently, GIBSON and BRAY (1979) reviewed the Hemiuroidea (The Hemiuroidea: terminology, systematics and evolution. *Bull. Br. Mus. nat. Hist.* (*Zool.*), 36: 35–146). According to them, two species of *Genolinea* in the present paper seem not to belong to *Genolinea*, but to the unknown genus of Bunocotylidae. I will describe it elsewhere on careful examination.